SECTION 15101

CONTROL VALVES

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PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

MILITARY SPECIFICATIONS

MIL-I-6869D (Notice 1)	Impregnants for Aluminum Alloy and Magnesium Alloy Castings
MIL-A-8625C(1)	Anodic Coatings, for Aluminum and Aluminum Alloys

MILITARY STANDARDS

MIL-STD-276	Impregnation of Porous Nonferrous Metal Castings

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B16.5-81	Pipe Flanges and Flanged Fittings

NATIONAL FIRE PROTECTION AGENCY (NFPA)

70-92	National Electrical Code

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

A-194/A194M-87	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High Temperature Service
A216/A216M-87	Steel Castings, Carbon Suitable for Fusion Welding, for High Temperature Service
A-320/A320M-87	Standard Specification for Alloy Steel Bolting Materials for Low-Temperature Service
A743/A743M-87	Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
B26-87	Aluminum Alloy Sand Castings
D751-79	Coated Fabrics, Methods of Testing
D-2000-86	Standard Classification System for Rubber Products in Automotive Applications

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

1.2 AVAILABILITY

Control valves specified herein shall be of one manufacturer. The valve manufacturer shall also produce the hydraulically-operated pilots.

1.3 SUBMITTALS

The submittal requirements of Section entitled ["Mechanical General Requirements"] ["General Requirements"] applies to the following list. All items shall be submitted for approval.

NOTE: SELECT "MECHANICAL GENERAL REQUIREMENTS" FOR NAVFACENGCOM PROJECTS OR "GENERAL REQUIREMENTS" FOR C.O.E. PROJECTS.

1.3.1 Shop Drawings

For each type control valve specified in this Section, submit the following:

a. Scaled sectional drawings of main valve and control pilot sy stems.

1.3.2 Manufacturer's Data

For each type control valve specified in this Section, submit the following:

a. Flow diagrams.

b. Operational description of the control valve and pilot control system.

c. Complete valve assembly list of materials, along with material Certificates of Conformance, used in the manufacture of the control valves and pilot systems.

1.3.3 Valve Manufacturer Certifications

a. Proof of experience on previous Air Force/Military projects.

b. Number of qualified (factory trained) engineers available to provide start-up support.

c. Written assurance as to ability to respond to specified time for field assistance.

1.3.4 Operation Test Data

a. Before shipment, each individual control valve shall be operationally tested and adjusted by manufacturer under actual flow conditions utilizing a hydrocarbon test fluid with a specific gravity comparable to [JP-4][JP-5][JP-7][JP-8] fuel. Manufacturer shall submit certified records of test data.

NOTE: SELECT FUEL TYPE

1.3.5 OMSI Submittals

OMSI information shall be submitted for each individual type control valve specified herein. Refer to Section entitled "Operation and Maintenance Support Information (OMSI)", for the information to be submitted.

PART 2 PRODUCTS

2.1 DESIGN CONDITIONS

Design conditions shall be as specified in Section entitled "Mechanical Equipment, Fueling". Components to be suitable for ANSI Class 150 (275 psig at 100 degrees F.)

2.2 CONSTRUCTION

2.2.1 General

Control valves shall be single-seated globe type, diaphragm actuated, hydraulically operated valves. Valves shall consist of three major components: the valve body, valve cover, and diaphragm assembly. The diaphragm assembly shall be the only moving part. In the event of diaphragm failure, valve shall fail closed against flow. The main valve shall be drip-tight when closed. Each valve shall have an external indicator to show the position of the valve disc at all times. Control valves shall be shipped from the factory as a complete assembly with all pilot controls and pilot auxiliary piping properly installed on the main valve. Materials which come in contact with the fuel shall be resistant to the effects of and not harmful to aircraft engine fuel and shall be aluminum or stainless steel unless noted otherwise. Materials for control valves, and items to be mounted on the valves shall be as follows:

2.2.1.1 Bodies, Bonnets, and Covers: Shall be constructed of one of the following materials:

a. Aluminum conforming to ASTM B 26 Type 356-T6 anodized in accordance with MIL-A-8625 Type II and surface coated in accordance with MIL-STD-276 (MIL-I-6869).
b. Cast steel conforming to ASTM A 216 Grade WCB internally plated with chromium, nickel or internally electroless nickel plated.

c. Cast stainless steel conforming to ASTM A 743.

Bodies shall have flanged inlet and outlet connections. Valve shall have a screwed bottom drain plug.

2.2.1.2 Valve Seats: Shall be stainless steel in accordance with ASTM A 743. It shall be possible to remove the valve seat while the valve is connected in the line. Valve seat and upper stem bearing shall be removable and screwed in the body and/or cover. The lower stem bearing must be concentrically contained in the valve seat and shall be exposed to flow on all sides. The diameter of the valve seat shall be the same size as the inlet and/or outlet flanges of the main valve.

2.2.1.3 Valve Discs: Shall contain a resilient, synthetic rubber disc conforming to ASTM D 2000 having a rectangular cross section, contained on three and one-half sides by a disc retainer and a disc guide, forming a drip tight seal against the seat. The disc shall be usable on either side. The disc guide shall be the contoured type capable of holding disc firmly in place during high differential pressure conditions that may develop across the seating surface. The disc retainer shall be capable of withstanding rapid closing shocks.

2.2.1.4 Diaphragm Assembly: Shall form a sealed chamber in the upper portion of the valve, separating the operating fluid from the line pressure. The diaphragm assembly shall contain a valve stem which is fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. Valve body and cover shall be sealed by the diaphragm. Valve stem shall be stainless steel. The bearing material shall be compatible with the fuel specified and shall not contain zinc coated metals, brass, bronze or other copper bearing alloys.

The diaphragm shall be a nonwicking material or design, with a minimum of two layers of nylon fabric bonded with a minimum of three layers of synthetic rubber (valves 2 1/2" and smaller one layer of nylon fabric). Materials to be resistant to aromatics of up to 50% in accordance with ASTM D-2000.

The diaphragm must have a MULLINS-burst rating according to ASTM D 751 of a minimum of 600 psi per layer of nylon fabric. All diaphragm sizes must be cycle tested to a minimum of 100,000 times, by alternately applying pressure under the diaphragm (main valve pressure) and above the diaphragm (cover chamber pressure). That test shall be certified by the manufacturer. The diaphragm shall not be used as a seating surface. The diaphragm must be fully supported by the body and cover in either the open or closed position.

2.2.1.5 Bolts, Screws and Nuts

a. For cast aluminum and cast steel body valves:

   Bolts and screws - Cadmium plated steel in accordance with SAE J 429 Grade 5.

   Nuts - Cadmium plated steel in accordance with ASTM 194 Grade 2 H.

b. For stainless steel body valves:

   Bolts, screws and nuts - ASTM A 320 Grade B8M C.1.1

2.2.1.6 Pilot Control System and Auxiliary Piping: Shall be Type 316 stainless steel. All screwed connections shall be made by conic unions (NPT). Tubing connections shall not be welded or sealed with O-ring.

2.2.1.7 Pilot Valves: Shall have stainless steel bodies conforming to ASTM A 743 with stainless steel internal working parts. Disc and diaphragm assemblies shall be as specified hereinbefore. The setting of adjustable type pressure operated pilot valves shall be easily adjusted by means of a single adjusting screw. The adjusting screw shall be protected by a threaded cap drilled to accommodate a lead-seal wire and a lock nut shall be provided on the adjusting screw to lock it in position at the desired setting.

2.2.1.8 Solenoids: For operation of pilot valves shall be housed in an explosion-proof case suitable for Class I, Division 1, Group D with maximum temperature rating of ("T2D" - 419 degrees F), hazardous locations as defined in NFPA 70. Solenoids shall operate on 120 volts, 60 cycle, single phase, alternating current. A manual type operator or needle valve to bypass the solenoid valve shall be provided for emergency manual operation.

2.2.2 Serviceability of Main Valve Internal Parts: Main valve movable parts including strainers, valve seat, stem bearings and control system shall be replaceable without removing the main valve from the line. All non-metallic parts shall be replaceable.

2.2.3 Total Lengths: The total valve length does not include the orifice plate flange (when used). If the control valve being supplied has the orifice plate built into its flange, the spacer provided shall bring the valves face-to-face dimension equal to those listed below, plus .875 inches.

Size (Inches)	Valve Length (Inches)
1-1/2	8.5
2	9.375
3	12
4	15
6	20
8	25.4
10	29.8
12	34

Tolerance shall be $\pm$ 0.030 inches for size 1-1/2 inches through 8 inches and $\pm$0.060 for size 10 and 12 inches.

Control valves not meeting these face to face dimensions shall be supplied with spacers suitable for the proper installation of the valve.

2.2.4 Flanges:

	MATERIAL	SEALING SURFACE
A:	Cast Steel, ANSI B16.5 Class 150	Raised Face
B:	Cast Stainless steel, ANSI B16.5 Class 150	Raised Face
C:	Cast Aluminum, Suitable for minimum working pressure of 275 psig at 100 degrees F	Flat Face

The mating flange shall be made the same as above.

2.2.5 Identification

2.2.5.1 The following shall be cast into the main valve body:

Pressure Class
Size

Material
Foundry heat number and identification
Manufacturer
Flow pattern

2.2.5.2 The following shall be cast into the main valve cover:

Size
Material
Foundry heat number and identification

2.2.5.3 Brass name plates shall be fastened to the valve. Body name plates shall list the following:

Size
Model number
Stock number
Manufacturer/supplier
Manufacturer's inspection stamp

2.2.5.4 Inlet name plate shall list the following:

Size
"Inlet" marking
Assembly model number
Part number

2.2.5.5 Outlet name plate shall list the following:

"Outlet" marking

2.2.5.6 Pilot Valves: Pilot valves shall be tag identified.

2.3 MATERIALS

The type of materials which come in contact with the fuel, if not specified hereinbefore, shall be noncorrosive. Refer to Section entitled ["Mechanical General Requirements"] ["General Requirements"] for metallurgic specification.

NOTE: SELECT "MECHANICAL GENERAL REQUIREMENTS" FOR NAVFACENGCOM PROJECTS OR "GENERAL REQUIREMENTS" FOR C.O.E. PROJECTS.

2.4 INDIVIDUAL CONTROL VALVE OPERATIONAL REQUIREMENTS

Operation, performance, and special features of the individual control valves shall be as specified herein.

2.4.1 High Liquid Level Shut-Off Valve (HLV-1 and HLV-2)

a. Size: 8 inch

b. Flow: 1200 gpm

c. Operation: High liquid level shut-off valve shall be hydraulically operated and shall be provided with a tank exterior mounted float. Activation point of the float for opening and closing the high liquid level shut-off valve shall be as shown on

the drawings. Upon a rise in fluid level to the float activation point, the float control system shall cause the main valve to close tightly. The main valve shall remain closed until a drop in tank fluid level occurs. Upon a drop in fluid level beneath the float activation point, the float control shall cause the main valve to open completely.

d. Check valve feature: Valve shall close rapidly when outlet pressure exceeds inlet pressure.

e. Manual test feature: Manual testing of high level shut-off valve and exterior mounted float's automatic opening and closing feature shall be possible.

f. Strainer: A 40 mesh stainless steel wire, self cleaning strainer shall be provided in the pilot valve supply piping.

2.4.2 Non-Surge Check Valve (CV-1 thru CV-5)

a. Size: 6 inch

b. Flow: 650 gpm

c. Operation: Non-surge check valve shall open slowly. Opening speed shall be adjustable from 2 to 30 seconds without affecting closing of valve. Factory set for 15 seconds.

d. Quick Closure: Valve closure to be rapid, closing quickly when outlet pressure exceeds inlet pressure.

e. Flow control: Valve to limit flow to 650 gpm. Sensing shall be by orifice. Valve to modulate to limit flow without hunting. Rate of flow to be manually adjustable.

f. Strainer: A 40-mesh, stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.4.3 Issue and Receiving Filter Separator Control Valve (FSCV-1 thru FSCV-7)

a. Size: 6 inch

b. Flow: 600 gpm

c. Operation: Filter separator control valve shall limit flow to 600 gpm. Controlling to be by orifice. Rate of flow to be manually adjustable.

d. Check valve feature: Valve shall close rapidly when outlet pressure exceeds inlet pressure.

e. Water slug shut-off: Valve shall close rapidly when water is sensed at filter separator sump high level as indicated by float control valve float position. Manual testing of operation shall be possible.

[f. Shut-off feature at maximum differential pressure: Valve shall close rapidly when differential control pilot increases to pre-set

point. Resetting of the differential control pilot shall be manually reset after each shut-off.]

NOTE: COORDINATE SELECTION OF THIS FEATURE WITH THE COMMAND FUEL FACILITIES ENGINEER.

2.4.4 Issue and Receiving Filter separator Float Control Valve with Manual Tester (FC-1 thru FC-7)

a. Operation: Float shall ride on the fuel-water interface inside filter separator sump and shall have two stages of operation. Activation at first stage shall open automatic water drain valve. Activation at second stage shall initiate water slug shut-off of filter separator valve.

b. Float control pilot and tester: The filter separator housing sump shall be fitted with a float control pilot valve assembly made of stainless steel. The pilot valve is connected to the filter separator control valve and to the automatic water drain valve. An integral float control tester shall provide a means to remove a portion of the float ball ballast allowing the float to rise, verifying operation of the water slug and flow control valve, the integrity of the float ball and the operation of the automatic drain valve.

2.4.5 Issue and Receiving Filter Separator Automatic Water Drain Valve (AWDV-1 thru AWDV-7)

a. Size: 3/4 inch

b. Flow: 18 gpm

c. Operation: Valve shall be normally closed and shall fail closed.

2.4.6 Back Pressure Control Valve (BPCV-1)

a. Size: 6 inch

b. Flow: 0-1200 gpm

c. Operation: Back pressure control valve shall modulate to maintain constant inlet pressure. Set-point shall be adjustable within a minimum range of $\pm$ 20 percent of the specified set point. Factory set at [80] psig.

NOTE: TO BE VERIFIED BY DESIGNER. A 15 PSIG LOSS THRU PIPE, VALVES AND FITTINGS FROM 6 INCH RISER ON FUEL SUPPLY LINE TO PANTOGRAPH INLET PLUS AN ALLOWANCE OF 65 PSIG REQUIRED AT PANTOGRAPH INLET. PANTOGRAPH REQUIRED INLET PRESSURE MAY VARY BASED ON MANUFACTURERS AND SIZE AND NUMBER OF LEGS.

d. Check valve feature: Valve shall close rapidly when outlet pressure exceeds inlet pressure.

e. Solenoid control: Solenoid control shall be as indicated on the drawings.

f. Speed control: Valve shall close slowly without affecting the opening speed and shall be factory set for 3 seconds. Closing time to be adjustable with a range of 2 to 30 seconds. Valve opening time shall be 1.0 second maximum.

[2.4.7 Pressure Control Valve (PCV-1)

a. Size: 2 inch

b. Flow: 50 gpm under normal operating conditions

c. Operation: Pressure control valve shall modulate to control inlet pressure and shall have adjustable set-point within a minimum range of ± 20 percent of the specified set point. Factory set at 75 psig.

d. Check valve feature: Valve shall close rapidly when outlet pressure exceeds inlet pressure.

e. Solenoid control: Solenoid control of valve shall be as indicated on drawings.

f. Speed control: Provide separate opening and closing speed controls each adjustable between 2 and 30 seconds. Factory set at 3 seconds.]

NOTE: OMIT WHEN USING SEQUENCE OF OPERATION SCHEME A.

2.4.8 Emergency Shut-Off Valve (ESO-1)

a. Size: 8 inch

b. Flow: 1200 gpm

c. Operation: Open/closed valve, solenoid operated. Closure shall be accomplished within 10 seconds upon power failure or actuation of an emergency-stop push button.

d. Solenoid control: Solenoid control shall be as indicated on the drawings.

e. Thermal relief: Valve to open for pressure equalization and return flow when downstream pressure exceeds upstream pressure.

2.4.9 Flushing Valve (FV-1)

a. Size: 6 inch

b. Flow: 0-1200 gpm

c. Operation: Valve shall open and close by means of hydraulic line pressure.

d. Solenoid control: The valve shall be provided with solenoi d control and shall operate as indicated on drawings.

2.4.10 Refueling Control Valve (RCV)

a. Size: 4 inch

b. Flow: 600 gpm

c. Operation: Refueling control valve shall modulate, by use of a liquid sensing line from Aircraft Direct fueling station venturi (FSV), and regulate the pressure at the skin of the aircraft, not to exceed 50 psig at any flowrate from 50 gpm to 600 gpm. Pressure to be adjustable with a range of 15 psi to 75 psi.

d. Quick Closure: Valve shall close rapidly when outlet p ressure exceeds control set point. Valve shall limit the surge pressure on the aircraft to a maximum of 120 psig when fueling at 600 gpm with an aircraft tank valve closure of 0.5 seconds. The valve shall re-open when the outlet pressure drops below the set point of the pilot if the deadman control lever is still depressed.

e. Hydraulic Deadman Control: Deadman shall be hydraulically connected to the pilot system of main valve. Valve shall open when deadman control lever is pressed and shall close rapidly when the lever is released. On rupture of the deadman hose between outlet of deadman control and main valve pilot system, there shall be no fuel leakage. Main valve shall close in five seconds maximum when one of the deadman hose couplers is disconnected.

f. Speed Control: Valve shall open slowly without affecting the closure rate. Provide adjustable speed control with a range of 2 to 30 seconds.

g. Thermal Relief: Valve to open for pressure equalization and return flow when downstream pressure exceeds upstream pressure.

h. Strainer: A 40 mesh stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.4.11 Overfill Valve for Product Recovery Tank (OV-1)

a. Size: 2 inch

b. Capacity: 50 gpm

c. Operation: Hydraulically operated overfill valve shall close automatically upon rising to Product Recovery Tank 80% fill level. Valve shall open automatically upon falling below Product Recovery Tank 80% fill level.

d. Control Float: Automatic opening and closing of the valve shall be initiated by a control float located within the Product Recovery Tank. Control float shall be provided with a manual tester, mounted external to the tank, for testing of Overfill Valve operation.

e. Pressure Reservoir: Valve shall be provided with a pressure reservoir to supply required hydraulic pressure for operation. Reservoir pressure to be supplied by Fuel Transfer Pump (FTP-1). Valve shall close upon loss of reservoir pressure.

f. Thermal Relief: Overfill valve shall be provided with a pressure sustaining control valve that shall automatically, upon inlet pressure rising to 200 psig, open allowing thermal relief around overfill valve. Pressure sustaining valve shall automatically close upon inlet pressure dropping below 200 psig.

g. Limit Switch: Limit switch shall be provided with valve for remote indication of valve open or closed position.

h. Strainer: Pressure reservoir inlet line shall be provided with a shut-off valve, strainer and check valve.

2.4.12 Pantograph Pressure Control Valve (PPCV-1 thru PPCV-[ ])

NOTE: SELECT QUANTITY BASED ON NUMBER OF AIRCRAFT DIRECT FUELING STATIONS. ONE PER STATION.

a. Size: 1 1/2 inch

b. Operation: Valve shall open and close by means of hydraulic line pressure. Initial setting shall be 75 psig and shall be field adjustable between the range of 50-100 psig. Final field adjustment pressure setting of valve shall be equal to 10 percent above recorded line pressure at 600 gpm flow rate.

c. Check Valve Feature: Valve shall close rapidly when outlet pressure exceeds inlet pressure.

[2.4.13 Bypass Valve (BPV-1)

a. Size: 8 inch

b. Capacity: 1200 gpm

c. Operation: Valve shall modulate open and closed hydraulically to relieve upstream pressure. Factory set at [ ] psi. Pressure setting to be adjustable with a range of 100 psi to 250 psi.

d. Limit Switch: Limit switch shall be provided with valve for remote indication of valve open or closed position.]

NOTE: THIS VALVE TO BE USED ONLY WHEN RECEIVING FUEL DIRECTLY FROM PIPELINE TO OPERATING TANKS. WHEN RECEIVING FUEL FROM BASE BULK STORAGE, USE MANUAL BALL VALVE. COORDINATE SELECTION WITH THE COMMAND FUEL FACILITIES ENGINEER. FACTORY SETTING SHOULD BE AROUND 20 PSI OVER RECEIPT PRESSURE.

PART 3 EXECUTION

3.1 VALVE TESTING AND START-UP SUPPORT

The Contractor shall provide the services of a factory trained service engineer employed by the valve manufacturer to verify that each valve has been properly installed and to verify valves were factory operationally tested, adjusted, and set per these specifications. The service engineer shall assist the Contractor in the valve start-up adjustment process and will remain on site until all control valves function as required by the contract documents.

3.1.1 Standard One Year Warranty Period

If a problem attributable to the valve's manufacturer or installation arises after the initial system start-up has been accomplished, and after system final acceptance date, the Contractor shall have [48] hours from the time of notification that a problem exists to solve the problem. The problem shall be solved to the satisfaction of the [Contracting Officer, the Base Civil Engineer and/or the Command Fuel Facilities Engineer] [Contracting Officer.] If the Contractor cannot effectuate a proper resolution to the problem as outlined above in the [48] hour period, the Contractor shall provide a factory trained engineer from the manufacturer of the valve within [48] hours after the expiration of the Contractor's initial [48] hour period to effectuate a resolution of the problem above. All services provided by the valve manufacturer shall be at no cost to the Government. When it has been determined by the Contractor and the valve manufacturer's representative that the valve(s) cannot be repaired in its installed position in the fuel system, it shall be replaced with a new valve and pilot assembly within [48] hours after the initial 96 hour period listed above expires and at no cost to the Government.

NOTE: MODIFY HOURS FOR PROJECTS OUTSIDE THE UNITED STATES.
NOTE: SELECT CONTRACTING OFFICER, THE BASE CIVIL ENGINEER AND/OR THE COMMAND FUEL FACILITIES ENGINEER FOR NAVFACENGCOM PROJECTS OR CONTRACTING OFFICER FOR C.O.E. PROJECTS. FOR C.O.E. PROJECTS, INCLUDE WARRANTY ENFORCEMENT RESPONSIBILITIES IN THE MoU.

3.2 TRAINING

The manufacturer shall conduct two (2) eight-hour training classes for liquid fuels maintenance technicians which include valve overhaul procedures, pilot overhaul procedures, valve adjustments, and valve diagnostics. The manufacturer shall provide a four inch valve mock-up with various trim components (i.e., rate of flow, solenoid control, and speed control features) to be used during training. The four inch valve mock-up shall become the property of the Government and shall be turned over to the Contracting Officer.

--End of Section--